

the two large teeth of left valve; the other tooth is small and round, fits into socket at anterior end of hinge plate of left valve; hinge of right valve not so well preserved as that of left valve.

*Measurements in mm.*—Some specimens are too incomplete to be measured accurately.

	Height	Length	Convexity (one valve)
Holotype 108691			12.2
Paratype 108692	35.3	49.3	16.7
Paratype 108692a	29.3	44.6	11.7
Paratype 108692b	27.3		10.7

*Comparisons.*—*Isopristes crassus* most closely resembles *Unio crassissimus* Sowerby, 1817, and *Unio listeri* Sowerby, 1817, but it differs from both these species in having a crenulated interior margin and radial ribs.

*Types.*—Holotype, left valve, U. S. N. M. no. 108691; five paratypes, four right valves and one left valve, U. S. N. M. no. 108692.

*Age.*—According to Dr. R. W. Imlay (oral communication) the bed in which *Isopristes crassus* was found is Upper Triassic (Noric Stage).

*Locality.*—U. S. Geological Survey locality no. 24388; Atacocha Mine, 16 km by airline (34 km by road) northeast of Cerro de Pasco, Department of Pasco, Atacocha District, Peru. The fossils came from the north side of Quebrada Chicrin, 215 meters N.85°E. from the portal of the 4,000-meter level of the Atacocha Mine.

ENTOMOLOGY.—*Hollandipsylla neali*, a new genus and new species of flea from North Borneo, with comments on eyeless fleas (*Siphonaptera*). ROBERT TRAUB, Lt. Col., M.S.C., Department of Entomology, Army Medical Service Graduate School, Washington, D. C.<sup>1</sup>

A new genus of ceratophyllid flea was among the distinctive ectoparasites collected in North Borneo during investigations on arthropod vectors and rodent reservoirs of disease conducted by a joint U. S. Army-British Colonial Office Medical Research Unit in July and August 1951. This new genus, collected from a flying squirrel, is described and illustrated below.

*Hollandipsylla*, n. gen.

Unique among squirrel fleas of the subfamily Ceratophyllinae in being eyeless and in possessing only three pairs of lateral plantar bristles on

<sup>1</sup> The illustrations were prepared by the author, with the exception of Fig. 4, which was drawn by Thomas Evans, of the Department of Entomology,

REFERENCES

- AGASSIZ, L. *Études critiques sur les mollusques fossiles. Monographie des Myes.* 287 pp., 39 pls. Neuchatel, 1842-1845.
- BITTNER, A. *Lamellibranchiaten der Alpenen Trias.* Abh. Geol. Reichsanstalt. **18**(1): 235 pp., 24 pls. 1895.
- COX, L. R. *Tutcheria and Pseudopis, new lamelli-branch genera from the Lias.* Proc. Malac. Soc. London **27**(1): 34-48, pls. 3-4. 1946.
- *Proposed use of the plenary powers to validate the generic name "Cardinia" (class Lamellibranchiata) as from Agassiz [1841], for use in its accustomed sense.* Bull. Zool. Nomenclature **4**: 59-64. 1951.
- *Notes on the Trigoniidae, with outlines of a classification of the family.* Proc. Malac. Soc. London **29**(2-3): 45-70, pls. 3-4. 1952.
- MENDES, JOSUÉ C. *Lamellibrânquios Triássicos de Rio Claro (Estado de São Paulo).* Univ. S. Paulo Faculdade Filosofia, Ciências e Letras, Bol. **45**, Geol. no. 1: 41-74, 2 pls. 1944.
- REED, F. R. COWPER. *Triassic fossils from Brazil.* Ann. Mag. Nat. Hist., ser. 10, **2**(7): 39-48, 1 pl. 1928.
- *Some new Triassic fossils from Brazil.* Ann. Mag. Nat. Hist., ser. 10, **10**(59): 479-487, pl. 19. 1932.
- SOWERBY, JAMES. *The mineral conchology of Great Britain* **2**: 251 pp., 203 pls. London, 1817-1818.
- WAAGEN, LUKAS. *Die Lamellibranchiaten der Pachycardientuffe der Seiser Alm, etc.* Abh. Geol. Reichsanstalt **18**(2): 180 pp., pls. 25-34. 1907.
- ZITTEL, KARL A. *Handbuch der Palaeontologie* **1**(2): 893 pp., 1,109 text figs. München und Leipzig, 1881-1885.

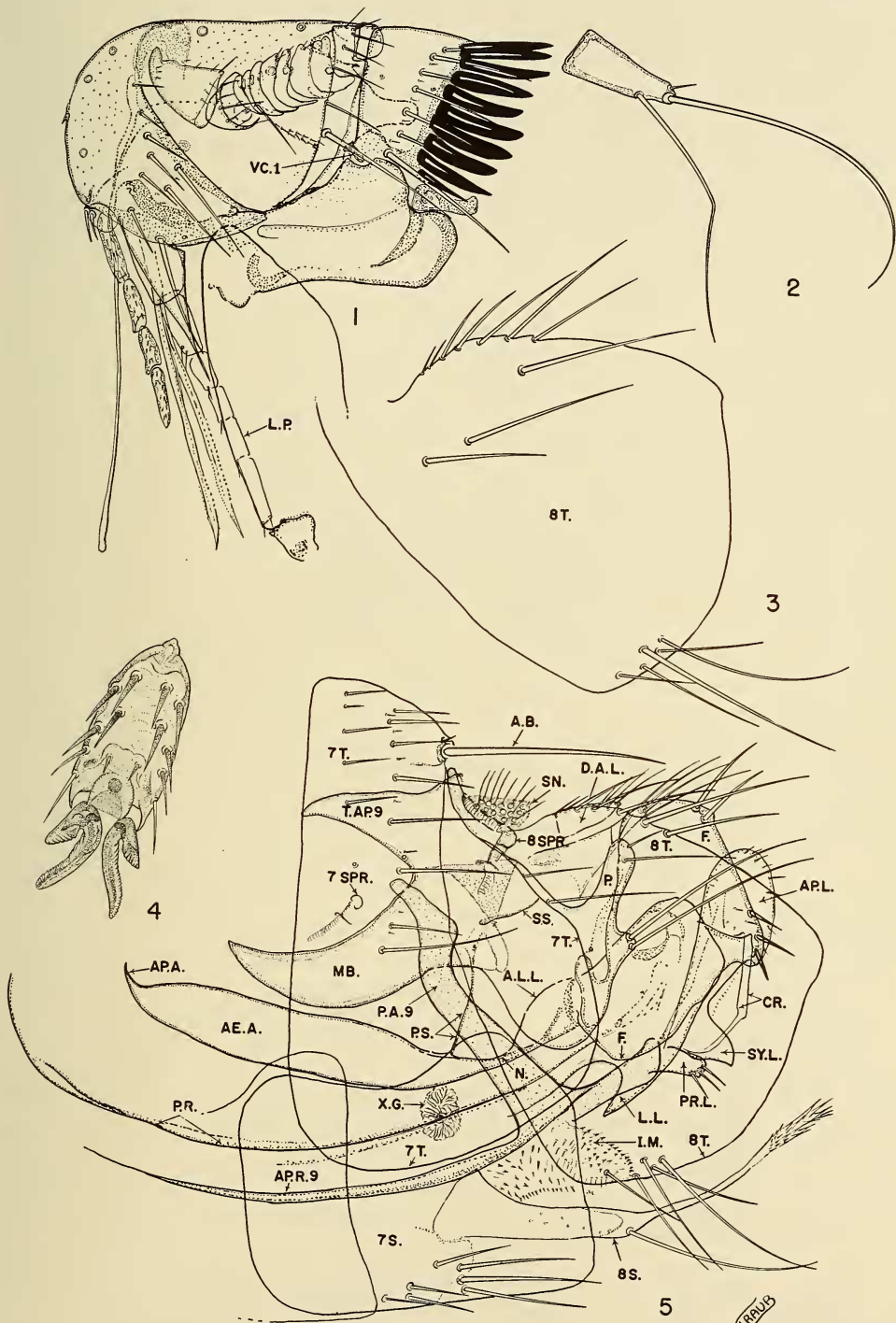
the last segment of the tarsi, two proximal pairs being displaced mesad.

Caput integrecipit. Eye completely vestigial. Pre-antennal region with two rows of bristles. Frontal tubercle small. Postantennal region with but one complete row of bristles and that marginal. Antennal segment II with bristles short in male, not reaching beyond proximal fourth of club; in female, extending beyond middle of club. Antennal groove extending onto propleuron in male. Labial palpi subequal in length to forecoxae. First vinculum or link plate (Fig. 1, VC. 1) received in distinct sinus of prosternosome; second and third vincula well developed; fourth

Army Medical Service Graduate School, to whom I am indebted.

absent. Pronotal comb consisting of about 11-13 spines on a side; spines typically about as long as pronotum. Pronotum with one row of long

bristles. Dorsolateral bristles of tibiae mainly paired, and of unequal length; "tibial comb" therefore lacking. Procoxae with many lateral bristles



Figs. 1-5.—*Hollandipsylla neali*, n. gen., n. sp.: 1, Head, male; 2, anal stylet, female; 3, eighth tergum, male; 4, fifth segment of male hind tarsus; 5, modified abdominal segments, male.

scattered over length of segment; other coxae with very few such bristles and these marginal or submarginal; mesal bristles virtually absent. Profemora lacking lateral, nonmarginal bristles. Lateral metanotal area (Fig. 9, *L.M.*) distinct. Lacking a pleural arch, i.e., pleural ridge of metasternosome not fitting into a socket. The skeletal sclerotization formed by dorsal ridge of lateral metanotal area and the pleural ridge extending dorsad into metanotum but becoming weakly sclerotized before reaching dorsal region of metanotum. Metanotum and some of typical abdominal terga with apical spinelets. Metepisternum lacking a squamulum. Meso- and metanotum and unmodified abdominal terga with two rows of bristles. First segment of hind tarsus subequal in length to II and III. Fifth segment of all tarsi bearing only three pairs of lateral bristles; with two proximal pairs displaced towards midline (Fig. 4). Mesotarsal segment V relatively broad, only about twice as long as broad. Typical abdominal spiracles small; on anterior segments resembling a flattened ovoid. Small apical teeth present on anterior abdominal terga. Male with one antesensillary (antepygidial) bristle, female with three or four. Eighth sternum reduced to a long narrow structure which is produced apically into an elongate filamentous process. Distal arm of male ninth sternum with a subacute secondary proximal lobe (Fig. 11, *SY.L.*). Lateral lobes of aedeagus (Fig. 10, *L.L.*) well developed and extending proximad of proximal lobes of distal arm of ninth sternum. Crochets (*CR.*) fairly large but weakly sclerotized; apically subtruncate. Movable finger of digitoid bearing spiniforms. Penis rods uncoiled (Fig. 5, *P.R.*). Anal stylet (Fig. 2) with an apical and also a ventromarginal long bristle. Ventral anal lobe rounded, not angulate. Bursa copulatrix (Fig. 6, *B.C.*) apically subglobose and with a long vermiform subacute duct. Spermatheca (Fig. 7, *SP.*) with head much longer than broad, and longer than tail.

*Genotype.*—*Hollandipsylla neali*, n. sp. The genus is named for George P. Holland, head, Systematic Entomology, Department of Agriculture, Ottawa, Canada, whose studies on Siphonaptera have been truly outstanding and to whom his coworkers in the field are greatly indebted.

***Hollandipsylla neali*, n. sp.**

*Types.*—Holotype male and allotype female, ex *Hylopetes* sp., a small flying squirrel, North

Borneo, Mt. Kinabalu, Tenompok, elevation 5000 ft.; collected by R. Traub, 1951; host collected by D. H. Johnson. No other specimens known. Types deposited in U. S. National Museum.

*Head* (Fig. 1).—Pre-antennal region with a posterior row of three bristles preceded by a row of about five or six much smaller bristles, of which the upper two or three in the male border the antennal groove. Eye completely vestigial, inapparent. The genal process subacute. Labial palpi five-segmented, reaching nearly to apex of forecoxae. Maxillary palpi with second segment subequal to first in length; palpi extending to about level of apex of third segment of labial palpi. Scape of antenna with marginal short bristles. Second antennal segment with apical bristles short in male, not reaching beyond apex of third segment; in female some of these bristles reaching to level three-quarters length of club. Postantennal region with a long bristle above midpoint of dorsal margin of antennal groove and with a caudomarginal row of bristles; ventralmost of row by far the longest; with a series of very short bristles in one or two longitudinal rows delimiting border of antennal groove.

*Thorax.*—Pronotum with a row of about seven bristles per side; with a comb of about 10 or 11 spines on a side in the male, 12 or 13 in the female; the spines fairly straight or slightly concave. Most spines slightly longer than pronotum is broad, as measured from anterior margin to base of spine. Mesonotum (Fig. 9, *MSN.*) with two rows of bristles. Mesonotal flange on each side with two or three pseudosetae (*PS.S.*). Mesepisternum (*MPS.*) with four or five fairly long bristles. Mesepimere (*MPM.*) with about seven such bristles, of which three long ones are in a horizontal line slightly below level of third vinculum. Metanotum (*MTN.*), together with its flange, as long as mesonotum; flange with one dorso-apical tooth. Lateral metanotal area (*L.M.*) slightly less than twice as long as broad; with three or four bristles, of which those near posterior margin are longest. Metepisternum (*MTS.*) with one long bristle in posterodorsal region flanked by one or two shorter ones. Metepimere (*MTM.*) with about six or seven bristles in three rows. Spiracle here is a short, oblate spheroid.

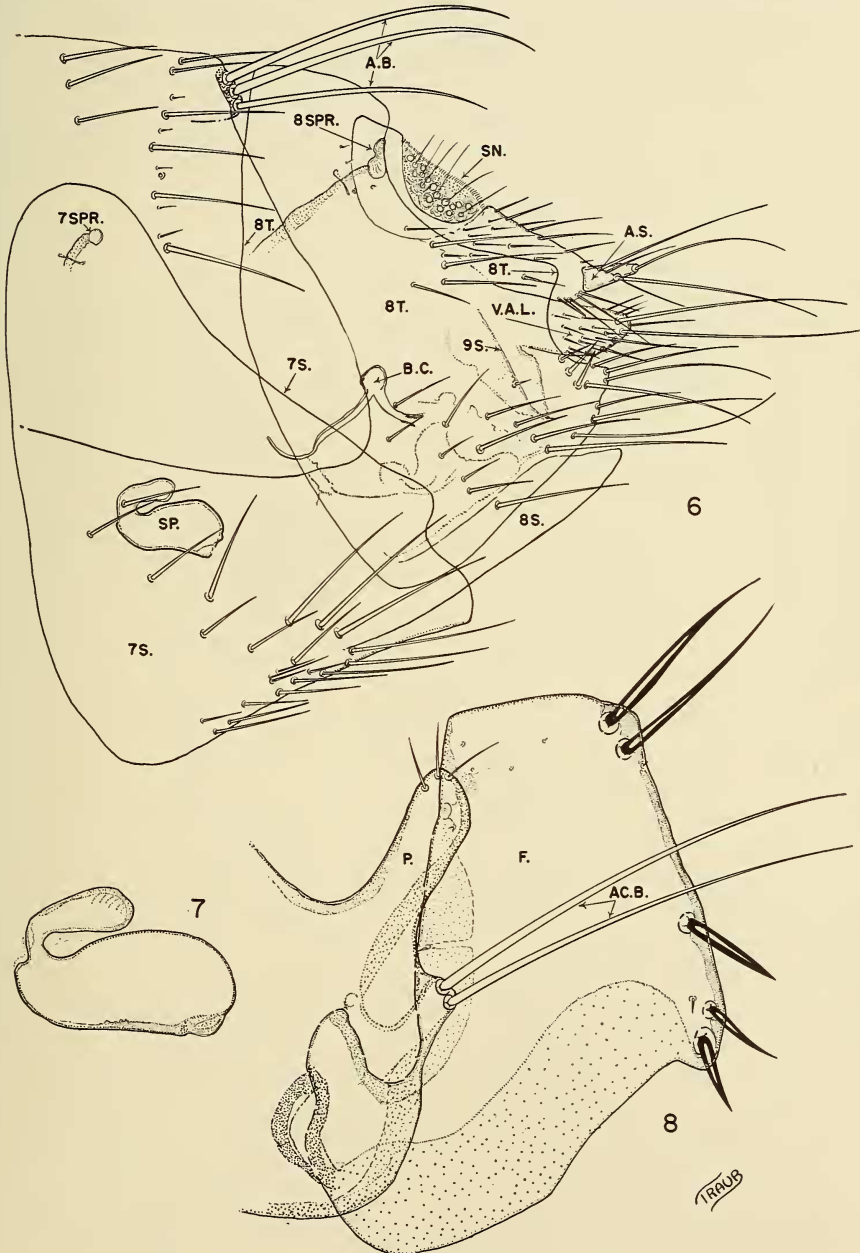
*Legs.*—Profemur with one fairly long apical ventromarginal bristle and two such proximal bristles; lacking lateral nonmarginal bristles; with only one mesal nonmarginal bristle; mesofemur



the same; metafemur quite similar but with an additional small ventromarginal subproximal bristle and lacking the mesal one. Protibia with stout dorsomarginal bristles arranged as follows: 1-2-2-2-1-2-2; mesotibia: 1-2-2(1 in female)-2-1-2-2; metatibia: 1-2-1-2-2-1-2-2. In mesotarsus, third segment with a distal bristle which extends beyond apex of fourth; in metatarsus this bristle merely reaching apex of fourth. Measurements

(in microns) of tibiae and segments of tarsi (petiolate base deleted) of holotype as follows:

Leg	Tibia	Tarsal Segments				
		I	II	III	IV	V
Pro.....	188	70	64	62	47	105
Meso.....	317	141	118	82	59	112
Meta.....	398	376	236	141	87	130



Figs. 6-8.—*Hollandipsylla neali*, n. gen., n. sp.: 6, Modified abdominal segments, female; 7, spermatheca; 8, process and digiloid of male clasper.

*Abdomen*.—First tergum (*1T.*) with two rows of bristles and one apical spinelet per side. Basal sternum lacking lateral or mesal bristles; with one ventromarginal bristle in male, two in female. Terga II to IV with apical spinelets as follows: 2-2-1 per side. First row of bristles on typical terga with about five to seven bristles per side, terminating well above spiracle; second row of bristles extending to or slightly below level of spiracle. Typical sterna in male with three or four subventral bristles per side, preceded by two to four smaller ones; in female with a row of five to seven bristles preceded by four to six smaller bristles in one or two ventromarginal rows. Antsensillary (antepygidial) bristles as follows: one long bristle in male; in female either three or four long bristles, of which upper two are slightly the longer.

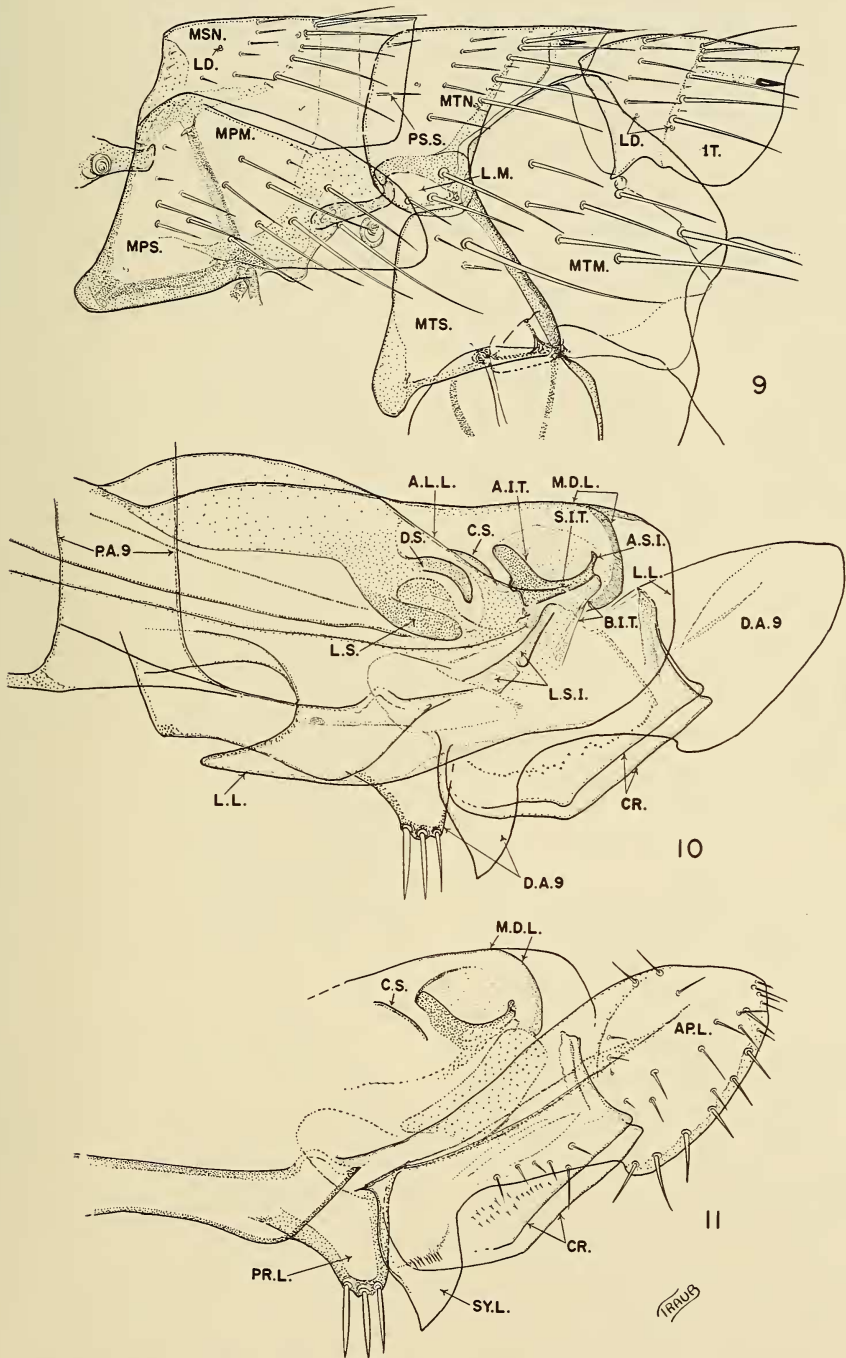
*Modified abdominal segments, male* (Fig. 5).—Eighth tergum (*8T.* and Fig. 3) very large and enclosing most of genitalia, as is typical for subfamily; with a dorsomarginal row of bristles of increasing size extending to just short of midpoint; remainder of dorsal region lacking bristles; with a closely appressed group of five submarginal bristles near ventrocaudal angle; and with three long lateral or subdorsal bristles. Eighth sternum (*8S.*) dorso-apically produced into a long semimembranous filamentous flap or projection as long or longer than rest of segment; apically minutely frayed; tufted; with a long, conspicuous ventromarginal bristle at origin of above long narrow flap; sclerotized portion of long bristle, more than five times as long as broad at midpoint—at base the ratio is three to one. With a frayed or spiculose semimembranous intersegmental process (*I.M.*) between eighth and ninth sterna. Immobile process of clasper (*P.* and Fig. 8) a long, thumb-like projection, with three small apical bristles. Acetabular bristle (*AC.B.*) inserted on a subacute convexity at a level slightly below midpoint of caudal margin of *P.* Movable finger or digitoid (*F.*) very large, essentially roughly cleaver-shaped; anterior and dorsal margins fairly straight; posterior margin angled and somewhat hooked, producing apparent caudal and ventral margins—of these, caudal margin mildly undulate and running slightly obliquely to anterior margin; ventral margin twice as long as dorsal margin, sinuate, with anterior half convex, posterior half concave. *F.* somewhat more than half as broad at midpoint

as long at maximum point; with two heavy stout bristles at dorso-caudal angle; with a sub-spiniform at hook of ventrocaudal angle; immediately above this another marginal spiniform; a third such subspiniform inserted at ventral third of caudal margin. Manubrium (*MB.*) broad but apically acuminate. Ninth sternum with proximal arm (*P.A.9*) narrow, subapically up-turned and then straightening so that apical portion is somewhat beak-shaped. Distal arm of ninth sternum (fig. 11) as long as proximal arm; its apical two-thirds modified along the ventral margin as follows: a conspicuous, ovate proximal lobe (*PR.L.*) which bears three short stout bayonet-shaped marginal bristles; immediately above and laterad to proximal lobe a peculiar broad subacute, downward-directed secondary lobe (*SY.L.*) which is devoid of bristles; distally expanded to form a long ovate apical lobe (*AP.L.*) which bears about 12 to 15 marginal bristles. In addition, distal arm with scattered thin bristles on apical lobe and two such dorsomarginal bristles; with about six ventromarginal thin bristles between secondary lobe and apical lobe.

Aedeagal apodeme (*AE.A.*) relatively narrow, about eight times as long as broad, as measured from the middle of the constricted neck (*N.*) to the short acuminate apical appendage (*AP.A.*); with a long, well-developed proximal spur (*P.S.*). Aedeagal endchamber (Fig. 10) characterized by the well-developed lateral lobes (*L.L.*) which are produced into conspicuous acuminate cephalad-directed flaps anterior to proximal lobe (*PR.L.*) of *D.A.9*. Median dorsal lobe (*M.D.L.*) slightly sinuate, heavily sclerotized where it turns straight ventrad at apex of inner tube. Crochets (*CR.*) quite long, about twice as long as broad but weakly sclerotized so that its outlines are difficult to see; caudal margin fairly well sclerotized, concave; ventral margin straight for about two-thirds its length, then curving upwards towards point of insertion; the peg-like sclerotization, characteristic of the crochet of ceratophyllid fleas, undeveloped, inconspicuous. Sclerotized inner tube (*S.I.T.*) short, bearing a prominent dorsoproximal thumb-like armature (*A.I.T.*) and with its apex (*A.S.I.*) produced upwards as a narrow spur. With sclerotized narrow band of inner tube (*B.I.T.*) extending distad of *S.I.T.* Lateral sclerotization of inner tube (*L.S.I.*) rather prominent. Crescent sclerite (*C.S.*) overlying apodemal strut, which is of the usual type. Sensillum (*SN.*) very flat, with about 15 pits

per side. Dorsal lobe of proctiger (*D.A.L.*) an isosceles triangle lying on its side; with a dorsal row of bristles; ventral lobe of proctiger longer and narrower, with an apical tuft of bristles.

*Modified abdominal segments, female* (Fig. 6).— Seventh sternum (*7S.*) with a shallow broad sinus on caudal margin. Lobes above sinus evenly rounded; with an irregular oblique row of about



FIGS. 9-11.—*Hollandipsylla neali*, n. gen., n. sp.: 9, Thorax; 10, end chamber of aedeagus; 11, distal arm of ninth sternum, male



eight fairly long bristles which merges with a ventromarginal row of approximately eight; with a row of three or four smaller bristles preceding the oblique row; in addition, with about five or six small ventromarginal bristles. Eighth tergum (8T.) with four or five bristles below sensillum five or six caudomarginal bristles below ventral anal lobe (V.A.L.) and a lateral and subventral group of about 13 bristles, two or three of which are submarginal; in addition, with three short mesal bristles below ventral anal lobe. Eighth sternum (8S.) lightly sclerotized, devoid of bristles. Dorsal anal lobe of proctiger with a row of marginal bristles and about 10 to 12 scattered lateral or lateromedian bristles; in addition, with five marginal bristles below anal stylet (A.S.). Anal stylet (Fig. 2) about three times as long as broad at base; with a very long apical bristle and a long ventromarginal bristle; with a tiny dorso-apical bristle. Ventral anal lobe (V.A.L.) almost evenly curved, not conspicuously angled. Spermatheca (SP. and Fig. 7) somewhat deformed in specimen extant but the head more than twice as long as broad; dorsal margin somewhat convex, ventral margin almost straight, with tail apparently recurved over head and much shorter than head. Bursa copulatrix (B.C.) subglobose, its duct slightly curved, short; with a narrow blind duct narrower than but more than twice as long as *ductus bursae*.

This species is named for Dr. William Neal, director of the Medical Services in North Borneo, who rendered great assistance to the Medical Research Units working in the field in North Borneo.

*Comment.*—Eyeless fleas are either parasites of typically subterranean or wholly nocturnal hosts, or else are forms that are characteristic inhabitants of rodent nests and modified accordingly (1, 2). The nest inhabitants are rarely found on the hosts themselves and apparently feed while the mammal or bird is sleeping. Such species of fleas typically possess elongate mouthparts and reduced chaetotaxy, including reduction in the size and/or number of spines of the genal and other combs (3). In the description of *Ceratophyllus arcuegens*, collected from the nest of cliff swallows, Holland (4) points out that this species is evidently rather sedentary, “as indicated by the rather large and deep abdomen as well as by some reduction of the legs and thorax.” *C. arcuegens* lacks the pleural arch, a socket arrangement or “head” capping the pleural

ridge. Certain other nest-fleas also lack a pleural arch, e.g., *Anomiopsyllus* Baker, 1904, *Megarhroglossus* Jordan and Rothschild, 1915, *Conorhinopsylla* Stewart, 1930, *Stenistomera* Rothschild, 1915, and *Wenzella* Traub, 1953. The pleural arch is also absent in some squirrel fleas, i.e., *Hollandipsylla* gen. nov., and, as pointed out by Traub (5), *Syngenopsyllus* Traub, 1950, *Tarsopsylla* Wagner, 1927, *Libyastus* Jordan, 1936, *Myoxopsylla* Wagner, 1927, *Brachyctenonotus* Wagner, 1929 and the fleas of the genus *Opisodasys* Jordan, 1933, which parasitize flying squirrels (*O. pseudarctomys* (Baker, 1904) and *O. vesperalis* (Jordan, 1929)). These squirrel fleas are relatively rare in collections even though their true hosts are fairly frequently encountered. Some (i.e., *Tarsopsylla*) have been found to be rather abundant in the nest of the host, but too little is known of the habits of these fleas to indicate whether such occurrence is the rule. The long labial palpi (i.e., *Syngenopsyllus*), the elongate legs (i.e., *Tarsopsylla*) and reduction in the size of the spines of the pronotal comb (i.e., *Brachyctenonotus*) in this group of fleas indicate that the squirrel fleas lacking the pleural arch may also be nest-inhabiting species. A pleural ridge of this type may therefore be an important structural modification of nest-fleas, and may be associated with the corresponding sedentary habits, as Holland suggests in the case of *Ceratophyllus arcuegens*.

Our current knowledge of the habits of *Hollandipsylla* are insufficient for us to determine whether the reduction of the eye is correlated with nest-inhabitation or with the nocturnal or crepuscular nature of the host, a flying squirrel. It is interesting, however, that reduced or vestigial eyes occur in unrelated fleas which parasitize subterranean or nocturnal hosts. Thus *Foxella* Wagner, 1929, and *Dactylopsylla* Jordan, 1929 (Ceratophyllidae), are parasites of American pocket gophers. *Pulex sinoculus* Traub, 1950 (Pulicidae), an eyeless species closely related to *P. irritans*, was collected on Guatemalan pocket gophers. The eyeless flea of the Cape dune mole, *Bathyergus maritimus*, is *Cryptoctenopsyllus* in gens (Rothschild, 1900) which is essentially a combless *Dinopsyllus* (Dinopsyllinae, Hystrihopsyllidae). Among the primarily nocturnal or crepuscular animals which carry fleas with reduced eyes are bats, parasitized by fleas in a distinct family, Ischnopsyllidae, and shrews (i.e., *Blarina*, *Sorex*) which are typically parasitized in North

America by *Doratopsylla* Jordan and Rothschild, 1912, and *Corrodopsylla* Wagner, 1929 (Ctenophthalminae, Hystrihopsyllidae). It should be pointed out that the above correlation is by no means perfect. In fact, the converse is apparently also significantly true. Certain nocturnal mammals have adapted themselves to their dim environment by developing enlarged eyes. The flying squirrels, the slow lorises (*Nycticebus*), and the tarsier are in this category. Certain fleas have apparently paralleled this development. Thus, some *Xenopsylla* occurring on nocturnal rodents in the desert have unusually large eyes. Other *Xenopsylla*, associated with similar hosts, have reduced eyes (e.g., *Xenopsylla crinita* Jordan and Rothschild, 1922), while the genus *Rooseveltiella* C. Fox, 1914, was established for a species occurring on the Cape mole rat, *Georychus*, or a similar burrowing mole-like animal, is actually an eyeless *Xenopsylla*.

*Summary.*—*Hollandipsylla neali*, a new genus and species of flea from a North Borneo flying squirrel, is described and illustrated in detail. It is unique among squirrel fleas of the subfamily Ceratophyllinae in being eyeless and in possessing only three pairs of lateral plantar bristles on the last segment of the tarsi, two proximal pairs being displaced mesad. Included is a discussion of species of fleas which are characteristic inhabitants of the nests of the hosts. It is pointed out that such fleas usually have elongate labial palpi and legs and are further characterized by a reduction of the eyes and in chaetotaxy and in the development of the thorax. Loss of the pleural arch of the thorax is common. It is pointed out that fleas which parasitize subterranean or nocturnal hosts usually have reduced or vestigial eyes, regardless of the true affinities of the flea species involved.

## LIST OF ABBREVIATIONS

A.B.	Antesensillary bristle.
AC.B.	Acetabular bristle.
AE.A.	Aedeagal apodeme.
AP.A.	Apical appendage of aedeagal apodeme.
AP.L.	Apical lobe of ninth sternum.
A.L.L.	Accessory lateral lobe.
AP.R.9	Apodemal rod of ninth sternum.
A.I.T.	Armature of inner tube.
A.S.	Anal stylet.
A.S.I.	Apex of sclerotized inner tube.
B.C.	Bursa copulatrix.
B.I.T.	Sclerotized band of inner tube.
CR.	Crochet.

C.S.	Crescent sclerite.
D.A.L.	Dorsal anal lobe of proctiger.
D.A.9	Distal arm of ninth sternum.
F.	Movable finger or digitoid of clasper.
I.M.	Intersegmental membrane.
L.L.	Lateral lobe of aedeagus.
L.M.	Lateral metanotal area.
L.S.I.	Lateral sclerotization of inner tube.
MB.	Manubrium.
M.D.L.	Median dorsal lobe of aedeagus.
MPM.	Mesepimere.
MPS.	Mesepisternum.
MSN.	Mesonotum.
MTM.	Metepimere.
MTN.	Metanotum.
MTS.	Metepisternum.
N.	Neck or constriction of aedeagus.
P.	Immovable process of clasper.
P.A.9	Proximal arm of male ninth sternum.
P.R.	Penis rod.
PR.L.	Proximal lobe of distal arm of ninth sternum.
P.S.	Proximal spur of aedeagus.
PS.S.	Pseudosetae.
S.I.T.	Sclerotized inner tube of aedeagus.
SN.	Sensillum.
SP.	Spermatheca.
S.S.	Subpygidial sclerite.
SY.L.	Secondary proximal lobe of D.A.9.
7S.	Seventh sternum.
8S.	Eighth sternum.
7SPR.	Seventh spiracle.
8SPR.	Eighth spiracle.
1T.	First tergum.
7T.	Seventh tergum.
8T.	Eighth tergum.
V.A.L.	Ventral anal lobe.
VC.1	First vinculum, or link plate.
X.G.	So-called X-gland of Wagner.

## REFERENCES

- TRAUB, R. *Johnsonaeopsylla audyi*, a new genus and new species of flea from North Borneo, with notes on the subfamily Leptopsyllinae (*Siphonaptera*). Journ. Washington Acad. Sci. **42**(9): 288-296, 9 figs. 1952.
- TRAUB, R. *Siphonaptera from Central America and Mexico, a morphological study of the aedeagus, with descriptions of new genera and species*. Zool. Mem. Chicago Nat. Hist. Mus. **1**(1): 1-127, 54 pls. 1950.
- TRAUB, R., AND TIPTON, V. J. *Jordanopsylla allredi*, a new genus and species of flea from Utah (*Siphonaptera*). Journ. Washington Acad. Sci. **41**(8): 264-270, 7 figs. 1951.
- HOLLAND, G. P. *Descriptions of fleas from northern Canada*. Can. Ent. **84**(10): 297-308, 25 figs. 1952.
- TRAUB, R. *Notes on Indo-Malayane fleas, with descriptions of new species (Siphonaptera)*. Proc. Ent. Soc. Washington **52**(3): 109-143, 64 figs. 1950.